

Duhring (L.C.)

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## SUPPLEMENT TO A CASE OF PAINFUL NEUROMA OF THE SKIN.

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IN the number for October, 1873, of the *American Journal of the Medical Sciences*, I described a remarkable case of painful neuroma of the skin. The patient at that time had already been under my observation six years. A drawing showing the cutaneous lesions and their distribution accompanied this article, which, together with the letter-press, gave a satisfactory idea of the disease. It was there remarked that the case was probably unique. Its resemblance to the better-known painful subcutaneous tubercle, originally described by Wood, of Edinburgh, was also alluded to; but it was shown to differ from this formation in important particulars. Shortly after this date, a case of painful neuroma of the skin was reported by Kosinski, which appears to have been almost identical in its general features with that under consideration, an abstract of which may be found in my "Treatise on Diseases of the Skin." I am not aware of any like case having been since reported.

In the July number of this Journal for 1874, there appeared a further report of this case, including an account of the exsection of a portion of the brachial plexus of nerves, performed by the late Dr. F. F. Maury, for the relief of the excruciating pain which the patient suffered. It will be recalled that the result of the operation was, at the date of the last published note, tolerably satisfactory, the pain having been greatly relieved. These notes were dated four or five months after the operation. Subsequently, however—within a year—the pain became more violent, and two years later existed as severely as before the exsection. Since this date, up to the time of death, no marked change occurred.

The patient died in the ward for skin diseases of the Philadelphia Hospital February 16, 1880, six and a half years after the operation, having been under my observation about thirteen years. There remains but little to record from the last published notes to the time of death. A few small tubercles appeared on the back, but they did not attain the usual dimensions. The paralysis and the general atrophy of the limb remained

unchanged. Death seemed to be the result of senile debility, the patient being in his eighty-third year. Notwithstanding the many years of great suffering, he continued in good general health until a month prior to his decease. Observations made a few days before death showed the area of hyperæsthesia to be the same as that recorded in the last report. The disease of the skin was everywhere exceedingly painful to the touch, while the whole limb was also the seat of spontaneous pain. Even during the last day the paroxysms of pain continued severe, causing him to cry aloud. Large doses of morphia did not materially lessen the suffering.

The *autopsy* was made by Dr. H. C. Boenning, house surgeon, thirty hours after death. There was complete absence of rigor mortis. The body was in a fair state of nutrition. The cicatrix over the left brachial plexus, situated one inch above the superior line of the clavicle at its middle third, was not adherent to the subjacent tissues, moving readily with the skin. The internal organs were for the most part normal. The brain was normal in appearance; the vessels at the base were the seat of atheromatous changes. The spinal cord was normal, as were also the membranes of the cord and of the brain.

The left (diseased) arm was semi-flexed, and seemed to be held thus by fibrous adhesions within the elbow-joint, slight motion only being possible. The shoulder-joint moved freely. The fingers of the left hand were flexed and distorted, and the nails were long and bent towards the palm. The skin of the anterior portion of the chest, from the median line of the sternum to the summit of the shoulder, and from the lower edge of the major pectoral muscle to the clavicle, of the outer aspect of the whole arm, and of the left scapular region, was the seat of discrete and confluent flat and raised tubercles, and in places of a diffuse tubercular infiltration, the lesions being most abundant over the outer aspect of the arm. The skin covering the forearm and hand was unusually thin, and was without sign of new growth. The deeper structures were laden with fat, which was infiltrated freely between the muscles, nerves, and vessels. Fatty degeneration and atrophy of the muscular tissue was marked.

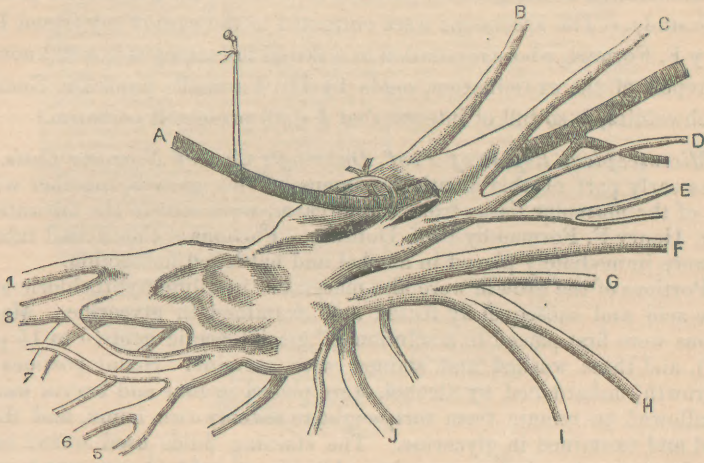
I am further indebted to Dr. Boenning for a delicate dissection of the nerves of the limb, as a result of which no connection between any of the nerve trunks or filaments and the tubercles was established; nor were any new growths found in the subcutaneous or deeper structures. The disease, therefore, was strictly cutaneous. The nerve-trunks were distributed normally. The brachial plexus of nerves was carefully dissected, when it was found that the cut ends of the nerves had united. A large ovoidal, whitish mass of firm tissue, one and a half inches in length, one-half inch in thickness, and one and an eighth inches in width, constituted the connecting band between the divided ends of the plexus. The formation was remarkably stout and strong. Its general form will be seen in the accompanying drawing, made by Dr. Boenning. The fifth and sixth nerves entered the mass as one trunk; the seventh alone, and on the upper surface. The lower two nerves, the eighth cervical and first dorsal, united to form a common trunk before entering the mass, or cicatrix, as it may be termed. From the lower end of the band there emerged three cords, which lower down divided into the various nerves of the arm. The nerves below the cicatrix were all more or less swollen and softened.

The nature of the cicatricial bond of union has recently been carefully

studied by my friend Dr. George de Schweinitz, whose report is as follows :—

*“Microscopical Report on the Cicatrix after Division of Brachial Plexus.*—A square piece was taken from the centre of the cicatricial mass, between the entrance of the 5th, 6th, and 7th cervical nerves, and the exit of outer cord of the plexus. The specimen having been for some time in alcohol, no further hardening was necessary, and the excised portion was immediately imbedded in wax, and vertical and horizontal cuts made and examined after having been stained with carmine.

Fig. 1.



The drawing (one-half natural size) represents the posterior or lower surface of the specimen. The nerves are drawn apart for the purpose of demonstration. The roots of the spinal nerves are indicated by figures 5, 6, 7, 8, 1, representing 5th, 6th, 7th, 8th cervical and 1st dorsal nerves. *A*, subclavian artery. Nerves: *B*, internal cutaneous; *C*, musculo-spiral; *D*, ulnar; *E*, circumflex; *F*, median; *G*, ? ; *H*, *I*, musculo-cutaneous; *J*, supra-scapular.

“Peripherally the mass is made up of various interlacing bands and bundles of areolar tissue (white fibrous), sometimes well felted together and again forming a texture of looser consistence. In this connective tissue bed there are a few rows of fat cells, and here and there bloodvessels in cross-section. More centrally there are numerous bundles of nerve fibres, surrounded by their perineural and epineural connective tissue investments. Many of the bundles are composed of well-formed normal medullated nerve fibres, exhibiting axis-cylinder, medulla, and Schwann’s sheath, the whole presenting a picture similar to what is seen upon making a cross-section of an ordinary spinal nerve. In some places, instead of a number of nerve bundles, a single fasciculus is seen surrounded by a mass of connective tissue. In other portions of the sections, the nerve fibres are not well formed, being either granular and degenerated or lacking in their full development into axis-cylinder, medulla, and sheath.

“Examination of many specimens shows that there has been abundant regeneration of the divided nerves and the formation of normal nerve tissue.”

It will be remembered that in the examination of the cutaneous tubercles as reported in the first account of the disease no nerve structures could be demonstrated, and that, therefore, the diagnosis of neuroma of the skin rested upon clinical grounds. It was, moreover, believed at this time that the failure to prove the nervous structure of the growth was due to faulty handling of the specimen. Several years later a tubercle was excised and examined, and the presence of nerve fibres demonstrated, an observation which was recorded in the first edition of my "Treatise on Skin Diseases," p. 506. With the death of the patient ample opportunity was afforded for the examination of the growth, portions of which were excised for microscopic study. The specimens were entrusted to the care of my friend Dr. Henry F. Formad, whose reputation as a skilful microscopist is well known. The report of the examination, made by Dr. Formad's pupil Dr. George de Schweinitz, is so full of interest that I shall present it verbatim.<sup>1</sup>

*"Microscopical Report of Prof. Duhring's Case of Neuroma Cutis.*—In the early part of this month specimens of this growth, together with some of the muscular tissue from the forearm, were sent to the laboratory of Dr. Henry F. Formad by Prof. Duhring. Portions of the excised tubercles were immediately placed in alcohol and hardened for section.

"Portions of the growth were also macerated in dilute hydrochloric and acetic acid and subsequently teased and examined in glycerine. Many sections were first placed in a solution of glacial acetic acid (5 to 15 per cent.), and these washed and stained with carmine. Small portions of the growth, unhardened by alcohol, were placed in lime and baryta water and allowed to remain from forty-eight to seventy-two hours, and then teased and examined in glycerine. The staining fluids used were: carmine, hæmatoxylin, indigo, carmine, chloride of gold ( $\frac{1}{2}$  per cent.), and osmic acid ( $\frac{1}{10}$  to 1 per cent.).

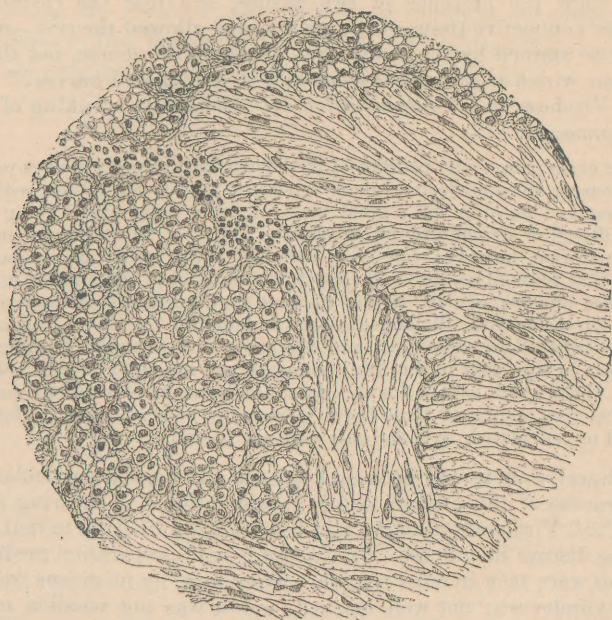
"Numerous transverse and vertical cuts, together with teased preparations, were made and examined by the methods above described. The growth consists essentially of the elements of the skin, densely packed connective tissue, and non-medullated nerve fibres. A typical section shows a connective tissue stroma, interwoven with the elements of the new-formation. The elements consist of fibres of various length and direction, but for the most part lying parallel with one another, each fibre being composed of a finely granular central substance, surrounded by a sheath, containing numerous elongated, oval, somewhat granular nuclei. In other words, it exhibits the elements of amyelinic or non-medullated nerves and the components of a true neuroma. In addition there may be seen yellow elastic tissue, bloodvessels with thickened walls which contain numerous nuclei, and finally, surrounding each vessel, small collections of round lymphoid cell-like bodies resembling in character the nuclei described in walls of the bloodvessels. (Fig. 2  $\times$  300.)

"The diagnosis of neuroma amyelinicum, which, thus far, rests merely upon the appearances of the growth, is further substantiated by the exclu-

<sup>1</sup> The description is extracted from an admirable inaugural thesis from the pen of Dr. de Schweinitz on "Painful Tumours, with special reference to Neuromata," presented for the degree of Doctor of Medicine in the University of Pennsylvania, 1881.

sion of unstriated muscular tissue and fibrillar connective tissue, with which tissues the growth has been confounded.

Fig. 2.



"1. In regard to the first-named tissue, leaving out of the question the unlikelihood of the situation, the peculiar and distinct manner in which hæmatoxylin stains the nuclei of unstriated muscular fibres is absent in any section under observation. The fibres of unstriated muscular tissue form flattened bands, interlacing in various directions, and not round fibres such as these show themselves to be, and while, indeed, they possess nuclei, these are not contained in a sheath. Finally, which is conclusive evidence, no muscular cell whatsoever could be discovered even after prolonged maceration in hydrochloric acid and subsequent careful teasing.

"2. The problem of entirely eliminating connective tissue is confessedly a more difficult one. While freely admitting the presence of a large amount of connective-tissue stroma, this does not do away with the entity of those fibres that have been designated as nerves. The size and thickness of the fibres, their roundness in cross-section, the presence of a distinct sheath containing nuclei along its continuity, and the difference and contrast between them and what is undoubtedly fibrous or connective tissue, all give evidence of their histological nature.

"But more than this: applying the liquor calcis and baryta water test, I find, after carefully teasing a macerated specimen of this kind, that the compact masses and bundles of connective tissue are resolved into their ultimate fibrils, but that lying among them are the same fibres, designated as nerves, unaltered by seventy-two hours' contact with these reagents. Furthermore, in those sections treated with carmine and osmic

acid, by way of an attempt at double staining, I find the papillæ of the skin and corium are stained with carmine, while the greater mass of the growth is coloured brownish black by the osmic acid. The experiment is quoted not so much as giving strong proof, but more as a curious fact which seems to show the presence of two tissues, and that the carmine has selected the connective tissue of the section and allowed the rest—nervous tissue—to be stained by the osmic acid, although, of course, not the inky black colour which it gives to the medulla of medullated nerves?”

“Prof. Virchow, in his *Krankhaften Geschwülste*, in speaking of amyelinic neuromas, says:—

“These cases (amyelinic neuromas) have been until recently always reckoned among fibrous or fibro-nucleated tumours, because after treating them with acetic acid we perceived nothing but a great mass of rather long nuclei lying among a firm, fibrillated or striped ground substance. . . . More careful handling of the preparation, however, convinces one that these nuclei are contained in fibres, and that these fibres lie for the most part parallel to one another and form quite distinct bundles, which, in the richness and regularity of their ovalish, narrow nuclei, differ from all connective-tissue bundles. . . . An essential difference between these neuromata and fibromata and so-called fibro-nucleated tumours rests in this, that in the first the nuclei are not contained in cells simply, but in fibres which have a double contour and can be followed for some distance. The cross section of these fibres is round or at least roundish, but never star-shaped or reticulated, as is the case with the fibromas.”

“The description, as will be seen, agrees in all essential particulars with the appearances of the growth under consideration. A drawing accompanying Prof. Virchow’s remarks also bears a close likeness to that representing the disease in our case. In one osmic acid preparation medullated nerve fibres were seen in cross-section. They were by no means frequent; the axis-cylinder was not well marked, and it was not possible to trace them to any connection with nerve trunk or branch. In one section only did there seem to be any connection between the nerves of the mass of the growth and those already existing in the skin. The elements of the skin differed in no essential particular from the appearances described in Prof. Düring’s original paper, pp. 8 and 9. The muscular tissue was teased and examined, mounted in glycerine. There was marked atrophy of the muscular fasciculi, and in many places there were evidences of fatty degeneration.

“These investigations were carried on in the laboratory of Dr. H. Formad, under his direct supervision, and the diagnosis has, in all particulars enumerated in the report, been confirmed by him.

GEORGE DE SCHWEINITZ.”

From the foregoing observations and studies, it may be therefore stated that the disease is a skin disease strictly speaking. No other structure was in any way involved. Concerning the nature of the growth there can remain no doubt. The microscopic studies made by myself originally, and later by Drs. Formad and de Schweinitz, which I have had the pleasure of corroborating, prove conclusively, I think, that we have a true neuroma of the skin—one of the rarest of diseases. It may further be remarked that the complete reunion of the cut cords of the plexus, and the regeneration of normal nerve-tissue is also a matter of great interest. The thorough repair instituted by nature in the form of the stout cicatrix

is likewise remarkable, though reunion was of course anticipated from the clinical history. Considering the character of this bond, it is questionable whether the excision of even two inches of the nerve would have proved sufficient to have prevented reunion.

In closing my report, I take pleasure in formally acknowledging my indebtedness to Drs. Boenning, Formad, and de Schweinitz, whose labours, I need scarcely state, give to this paper its chief value.

